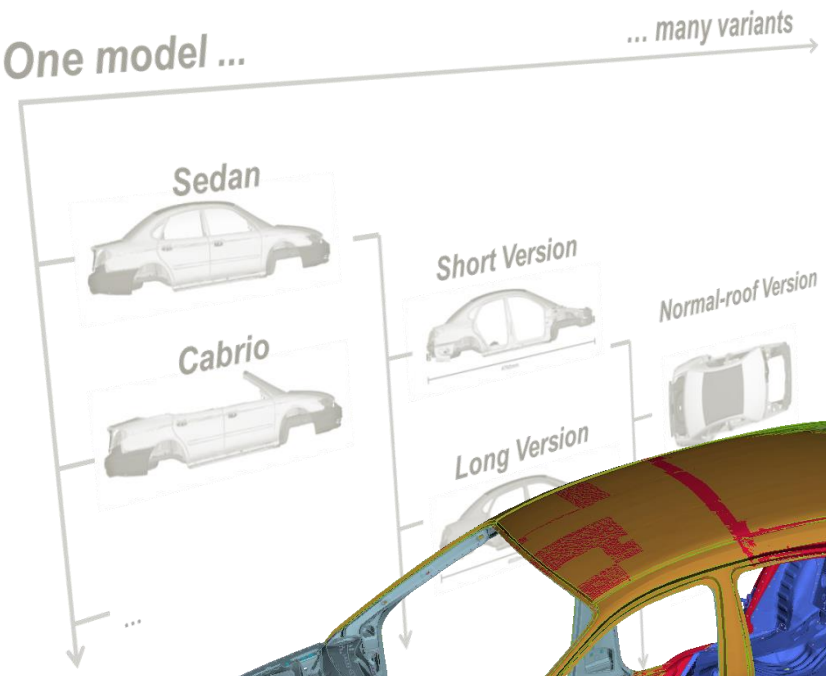
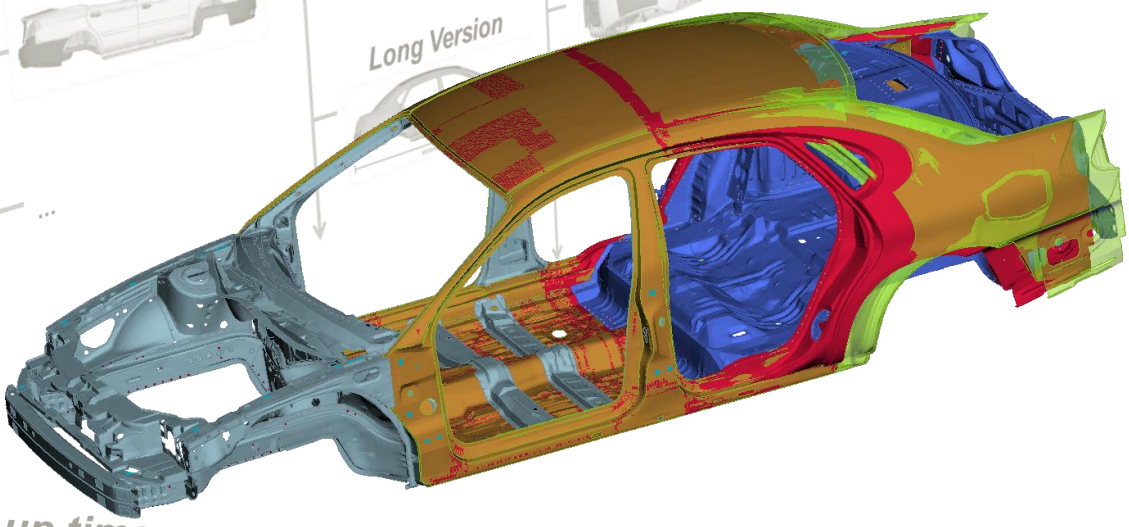
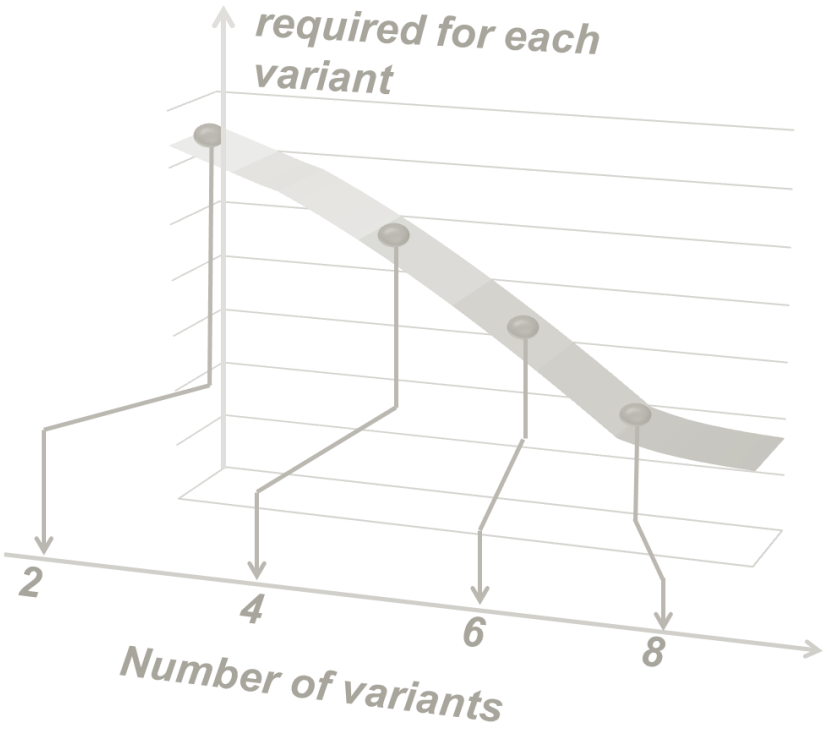
ANSA
µETA
PostProcessor
pioneering
software systems

Multivariant / Multidiscipline model buildup





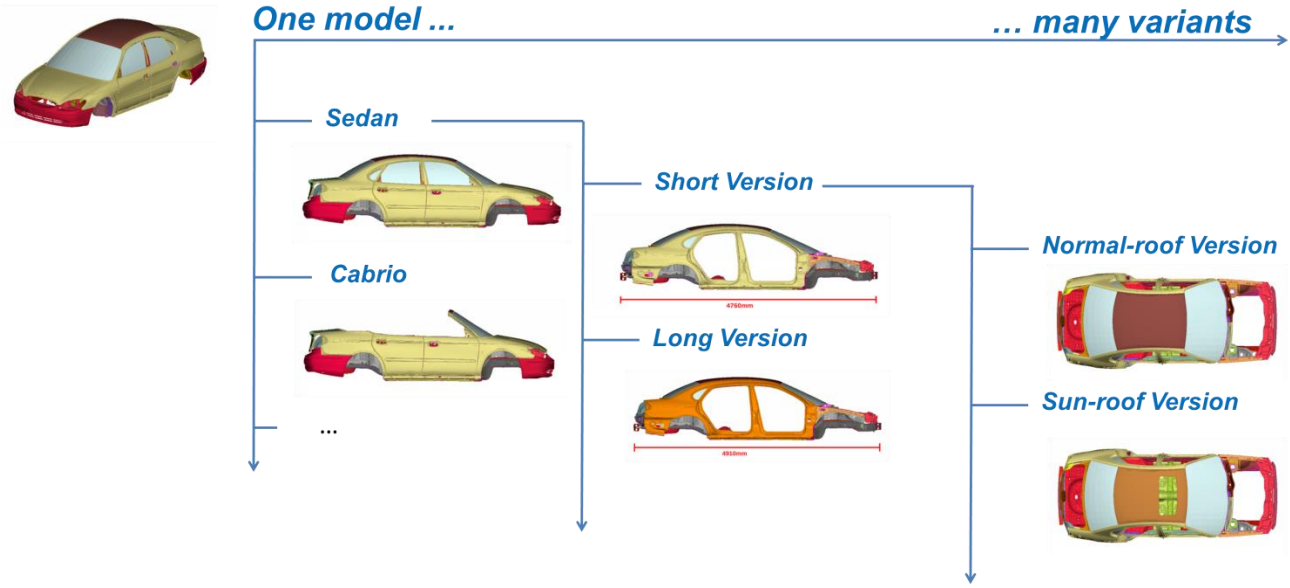


BETA CAE Systems SA

Introduction

The trend to much more individuality in automotive products mandates the creation of numerous digital prototypes. As the demand for quality continues to rise, these digital prototypes become even more complex while simulation analyses are required for numerous disciplines, such as , Crash, NVH, Durability, CFD and for sub studies such as side, rear or front impact in crash analyses.

Meanwhile, multiple variants can exist for one product, i.e. cabrio, coupe, long or short versions while additional differences, such as left or right hand driving, different gearboxes or engines also add up to the complexity and time consumption for building up, maintaining and updating the databases that include the information for each variant.



Furthermore, the need to handle different Digital Mock-Up (DMU) systems further increases the complexity, time consumption and error proneness of the CAE processes.

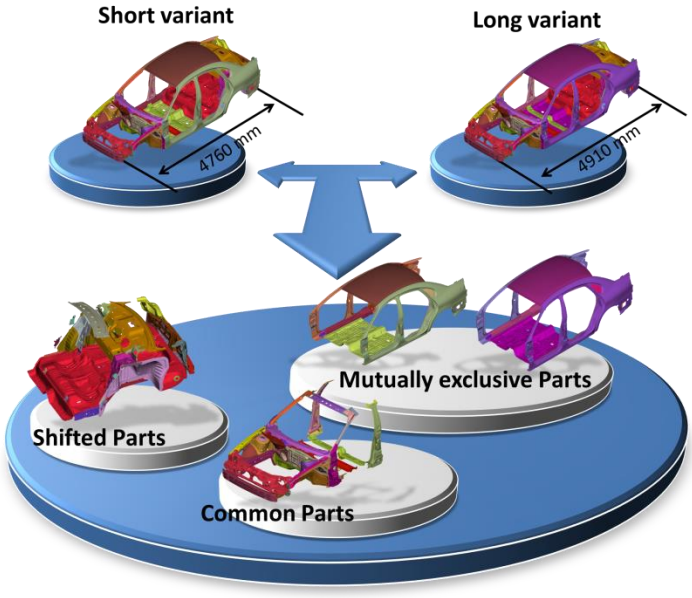
BETA CAE Systems S.A. through its flagship product, ANSA pre-processor offers a unique solution for facilitating Multivariant / Multidiscipline model buildup by employing the dedicated tools, available only in ANSA, with a robust, yet easy and user friendly methodology, called the **Common model**.

The “Common model”

Through the Common model methodology it is now possible to have one and only one database which serves as a neutral file carrying all the information translated from the DMU “world” to the ANSA “world”.

This file acts as a repository file and carries the information for Parts hierarchy, the Corresponding Geometries and attributes, the Material Info per part, and the connectivity info. Additionally, it carries the **ANSA 150% Model** which includes all the parts for all variants.

These parts are grouped into the **Mutually exclusive** parts which make the differentiation between the variants, the **Shifted parts** which differentiate in terms of positioning, and the **Common parts** which exist identically in each variant.



The Process

As the first step of the Common Model methodology, the Product tree from CAD is transformed into a model tree in ANSA. This is accomplished through the **ANSA Product Tree Editor**, an integrated tool within ANSA which provides all the essential functionality for managing tree structures. The CAE product tree is then imported in the **ANSA Part Manager**, the central tool for model management.

Then, the CAD data are automatically translated into ANSA through **ANSA translators**, which allow direct access to the geometric and technology data of CAD designs, with automatic assignment of the part attributes, such as weight, material name, thickness, manufacturing process. During the translation engineers can:

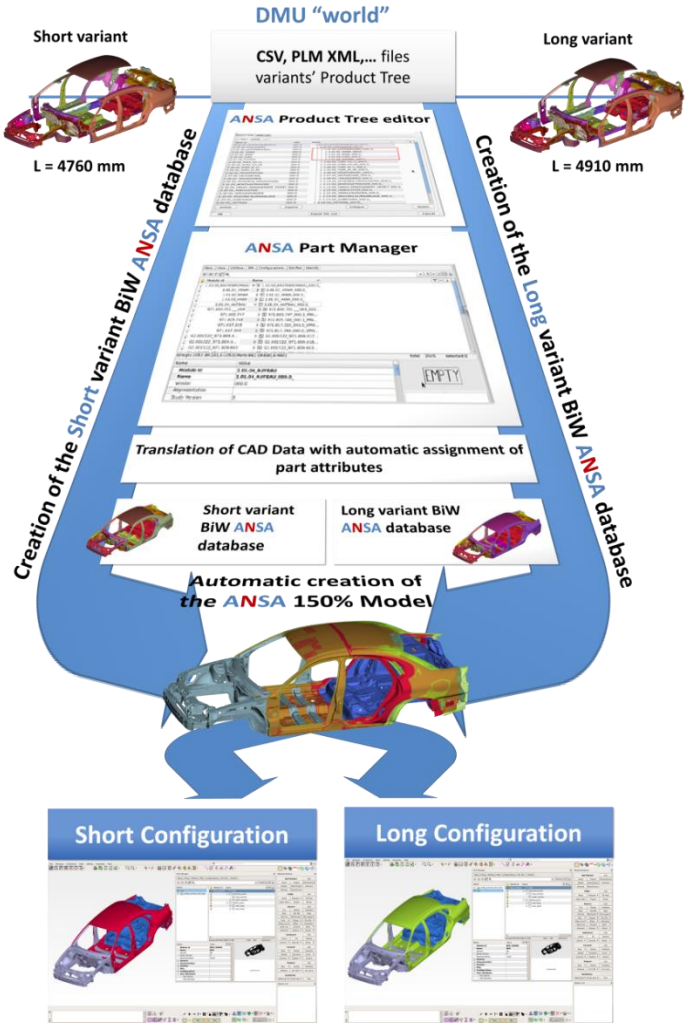
- create the mid-surface geometry,
- handle different CAD files formats per part,
- heal geometry mistakes,
- retrieve engineering data such as material name saved in each CAD file,
- identify the thickness of the parts.

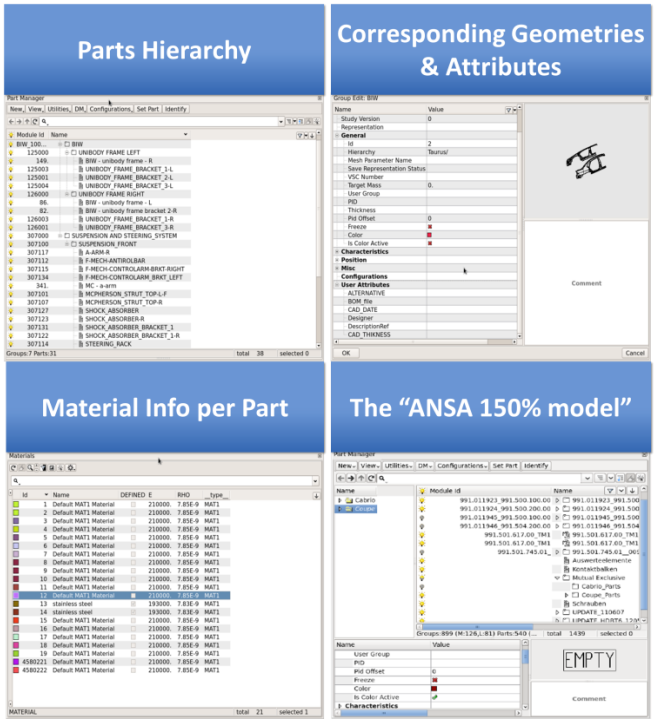
The end result at this stage is one different database for each variant.

The process continues by employing the **Compare tool** of ANSA to merge these databases. This tool allows the full comparison of two models for the identification and handling of differences in geometry, connections, solver-specific definitions as well as in various attributes of entities. Through the Compare tool, the Mutual exclusive parts, the Common Parts, and the Shifted parts are identified to form the **ANSA 150% model** in which the common parts are represented, and thus treated, only once.

The final step is the definition of what parts from this database belong to which variant in order to create the different **configurations** for each variant. By defining the different configurations for each variant it is possible to handle and move from one variant to the other with only one click.

As a result, the user can have one and only one database used as a repository for the Parts Hierarchy, the Corresponding Geometries and Attributes, the Material Info per Part, and the "ANSA 150% model", for each of which a dedicated tool exist in ANSA for managing them.



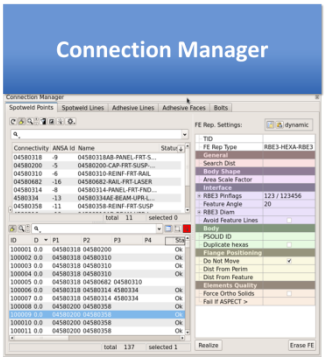


Connectivity

Connections can also be merged creating the "**150% model for connection points**". Again, the connections are categorized in **Common connections**, **Mutually exclusive connections**, and **Shifted connections**. With the geometry already split, this process can be automatically accomplished since connections carry the information of their groups or connecting parts.

Through the configurator, the connection points can be easily activated or deactivated taking into consideration the participation of the connected parts to the active configuration.
Additionally, it is possible to enter and maintain in the CAE model a variety of additional attributes that concern the connection itself. (e.g. at adhesive line we are able to store the glue material).
By organizing your connections with ANSA templates it is also possible to group them according to the FE representation that will be used in the models e.g. different templates for spotwelds, clinchen and rivets.

All the above mentioned, among other, processes can be easily accomplished through the **ANSA Connection manager**, a dedicated tool for managing connections.

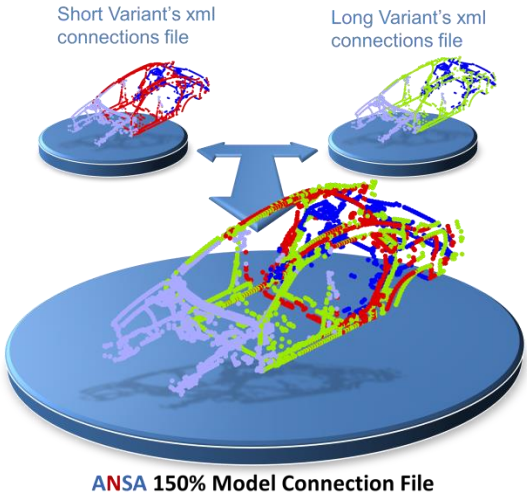


Conclusions

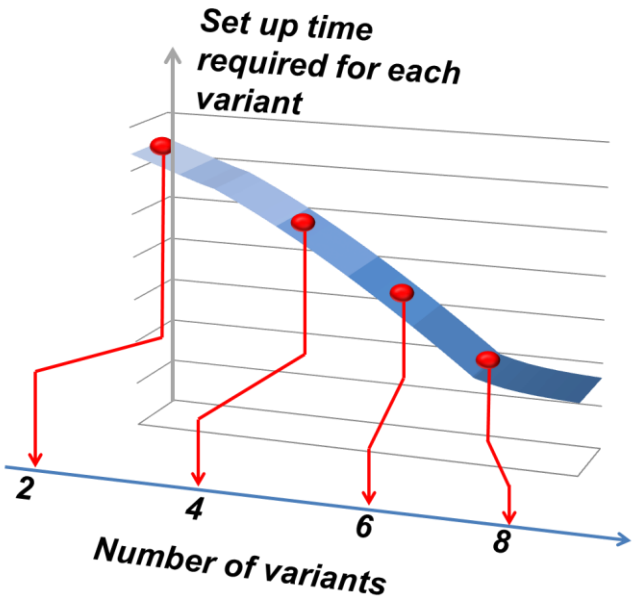
The common model approach offers the opportunity to handle multiple variants in an easy, yet effective way. It offers the capability to handle multiple variants of a model in a process that eliminates errors and that reduces greatly time to market.

During the build up of the model, engineers can avoid performing multiple times all tedious processes on the common parts of the models. In this way **the set up time for each variant is reduced exponentially as the number of different variants increase**.

Additionally it is now posible to **maintain one and only one source file instead of multiple databases**. Thus, the data exchanges between users is greatly facilitated, ensuring also that engineers are working on the most up to date data.



ANSA 150% Model Connection File



Benefits

- During the build-up of the models time consuming processes on common parts of the variants, such as connection points check, penetration check, definition of solver dependent entities, are performed only once.
- Process robustness is secured through a much shorter and better defined roadmap.
- One and only one source file with all the information of the model.
- Connection points can automatically be activated or deactivated according to the configuration.
- Ease of data communication between engineering teams.
- Engineering can always be sure that they work with the most up-to-date data.